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ABSTRACT

This booklet of tests is designed to accompany "Competencies for Articulation: Electronics"--CE 026 993. The written test questions suggest the knowledge level needed to accomplish the skills necessary to complete each competency. It is suggested that they may be used to assess the development of competencies or they may be used as examples of tests teachers may develop or select. The document is part of a series of guides designed to help articulate vocational education student progress from one level of training to another (secondary/postsecondary) and to employment--see note. (KC)

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TESTS

ED194752

competencies for articulation

ELECTRONICS

OE 026 994

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PREFACE

Tests to measure vocational competencies provided in this booklet are designed to accompany the booklet Competencies for Articulation for Electronics. Test materials may be helpful to secondary and post-secondary administrators and staff in determining competencies developed by students and in determining appropriate levels of advanced placement for students.

These tests may be used as instruments to accurately assess the development of competencies or they may be used as examples of tests teachers may develop or select. When selecting or developing tests other than those provided in the booklet, it is important that the testing instruments and the methods of testing measure the task/s, using the conditions and limitations and the criteria for acceptable performance for each competency.

The following written test questions are for sample use and only suggest the knowledge level needed to accomplish the skills necessary to complete the competency. They in no way reflect the limits of knowledge, skill or attitude required. In the final analysis, the student will be responsible for the ability to complete the competency as stated.

Competency 1

1. b
2. b
3. b
4. c
5. d
6. c
7. c
8. c
9. a
10. a
11. d
12. a

Competency 2

1. d
2. a
3. b
4. d
5. d
6. a
7. d
8. c
9. d
10. c
11. d
12. b
13. a
14. c
15. b

Competency 3

1. d
2. c
3. b
4. b
5. d
6. b
7. M
   0
   0
   0
   0
   0
   0
   0
   0
   1
8. b
9. a
10. a
11. c
12. d
13. c
14. c
15. d
16. a
17. c
18. b
19. d
20. b

Competency 4

1. b
2. d
3. b
4. c
5. a
6. d
7. b
8. d
9. c
10. b

Competency 5

RF Amplifier

1. c
2. a
3. b
4. c
5. c
6. d
7. d
8. d
9. b

AF Amplifier

1. d
2. b
3. d
4. d
5. a
6. b
7. c
8. d
9. c
10. d
11. a
12. c

Competency 6

Hartley

1. a 2. c

Colpitts

3. b 4. d

Multivibrator

5. b 6. d

RC Phase Shift

7. b 8. c

Crystal

9. b

4

TASK: To desolder and solder components:

_____ 1. Applying a small amount of solder to a hot soldering iron tip is known as:
a. capillary action
b. tinning
c. heat sinking
d. strain relief

_____ 2. Flux is used in soldering to obtain.
a. a rosin joint
b. good solder flow
c. oxidation
d. an alloy

_____ 3. Soldering irons are rated according to:
a. color
b. power dissipation
c. weight
d. length of cord

_____ 4. A good solder joint is indicated by:
a. a shiny appearance
b. good solder flow
c. both a and b
d. none of the above

_____ 5. A plated soldering iron tip should not be cleaned with:
a. flux
b. a wet sponge
c. wet rag
d. file

_____ 6. In electronics the most common permissable soldering flux is:
a. acid
b. beeswax
c. rosin
d. carbon tetrachloride

_____ 7. A cold solder joint can be caused by:
a. insufficient heat
b. movement of the joint
c. both a and b
d. none of the above

_____ 8. A small amount of solder can be applied to the solder tip when soldering a joint for the purpose of:
a. insulating the connection
b. making a rosin joint
c. enhancing heat transfer
d. none of the above

_____ 9. Solder which is commonly used in electronics consists of:
a. 60% tin and 40% lead, rosin core
b. 60% lead and 40% tin, acid core
c. 60% lead and 40% copper, nickel core
d. 60% tin and 40% silver, iron core

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_____ 10. A soldering iron to be used to solder a #20 wire to a printed circuit board would generally be:
a. 40 Watt
b. 100 Watt
c. 250 Watt
d. 600 Watt

_____ 11. If it is necessary to remove flux after soldering a joint, which of the following should be used?
a. lacquer thinner
b. lighter fluid
c. carbon tetrachloride
d. rosin solvent

_____ 12. "Wicking" is:
a. a process of drawing solder off or on to a surface
b. another name for soldering a joint
c. a process of removing flux
d. all of the above

TASK: To perform basic operations with test equipment:

_____ 1. A VOM and a VTVM contain a battery so that the meter can be used to measure:
a. DC voltage
b. AC amperage
c. AC voltage
d. DC resistance

_____ 2. A VTVM/DVM could be used to directly measure:
a. voltage
b. inductance
c. conductance
d. all of the above

_____ 3. An ohmmeter could be used to directly measure:
a. inductance of a coil
b. DC resistance of a coil
c. capacitance
d. circuit conductance of a light bulb

_____ 4. A VOM could be used to directly measure:
a. inductance
b. capacitance
c. conductance
d. resistance

_____ 5. "Infinity" is used on a VTVM meter scale to indicate a value of:
a. amperage
b. DC voltage
c. conductance
d. none of these

_____ 6. A 33 ohm resistor can be measured most accurately on the:
a. R × 10 range
b. R × 100 range
c. R × 1K range
d. R × 10K range

_____ 7. A LCR bridge could be used to measure:
a. capacitance
b. inductance
c. resistance
d. all of the above

_____ 8. To measure a voltage when one has no idea what the value will be, one should:
a. start with the voltage range that is the lowest
b. start with the voltage range that is half way between the lowest and the highest
c. not attempt to take a reading at all until more information is available

_____ 9. A scope correctly connected to measure the voltage at the outlet in a laboratory shows 340 volts peak-to-peak. When a VTVM is placed across the same two points it measures about 120 VAC. This indicates that the:

a. scope is not calibrated or has a malfunction
b. VTVM is not calibrated or has a malfunction
c. both the scope and the VTVM need to be re-calibrated or repaired
d. both the scope and the VTVM are properly calibrated and working properly

_____ 10. DC BETA is a term used to indicate:

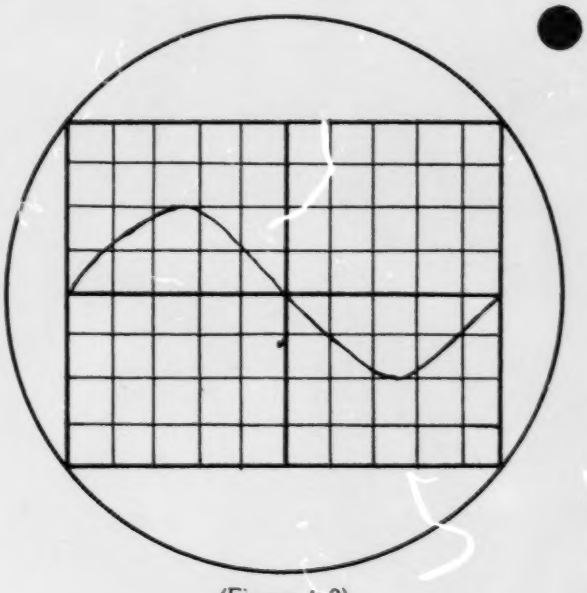
a. leakage current
b. resistance of a transistor forward biased divided by its resistance reverse biased
c. ratio of DC collector current to the DC base current
d. none of these

_____ 11. You have your VOM set to measure DC volts on 10 volt range. You accidently connect the meter across 8 VAC. What would be the expected reading:

a. 11V
b. 22V
c. 8V
d. 0V

_____ 12. The calibrated time-base control is set to 0.5 micro seconds/division. What is the frequency of the displayed wave form in Figure 2-0?

a. 20 KHZ
b. 200 KHZ
c. 2.0 MHZ
d. 200 HZ



(Figure 2-0)

_____ 13. If the calibrated vertical channel input is set to 10 volts/div and one is using a 10:1 attenuator probe, what is the amplitude of the signal in Figure 2-0?

a. 200 V peak
b. 200 V peak-to-peak
c. 200 V RMS
d. 200 V average

_____ 14. An ohmmeter is connected across the output of a 100V DC supply. When the supply is activated, which of the following would apply:

a. the meter will show 50 Ω on RX10
b. the meter will show 10 amperes
c. the meter may be damaged
d. none of the above

_____ 15. An ammeter should be connected:

a. in parallel with the circuit
b. in series with the circuit
c. in an AC wall outlet
d. all of the above.

8

Figure 2-1

Measurement	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
Test Points										
Voltage										
Range Selected										
Meter Function AC/DC										

Figure 2-2

Measurement	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
Test Points										
Current										
Range Selected										

Figure 2-3

Resistor	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
Rated Value										
Tolerance										
Measured Value										
In/Out of Tolerance										

Figure 2-4

Measurement	#1	#2	#3	#4	#5
Test Points					
Measured Voltage					
Vertical Channel Setting					
AC/DC					

Figure 2-5

Generator Setting	#1	#2	#3
Measured Frequency			
Time/Base Setting			

Figure 2-6

Frequency	500Hz	1000Hz	5000Hz
Phase in Degrees			
Lead/lag with $E_{generator}$ as reference			

Figure 2-7

	RESISTORS			CAPACITORS			INDUCTORS		
	#1	#2	#3	#1	#2	#3	#1	#2	#3
Measured Value									

Figure 2-8

Transistors	#1	#2	#3	#4	#5
Measured Beta					
Measured Leakage Current					
Type NPN/PNP					

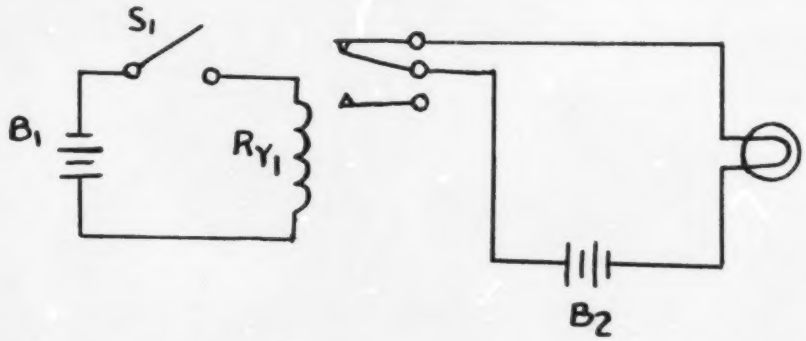
TASK: To service basic logic circuits:

___ 1. The binary number 1011 represents which decimal number:

a. 3
b. 5
c. 8
d. 11
e. 12

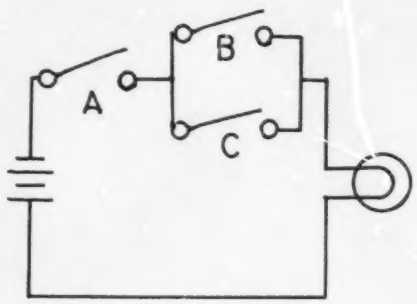
___ 2. The schematic below represents which logic circuit:

a. OR
b. NOR
c. NOT
d. NAND



___ 3. Which Boolean expression describes the circuit shown below:

a. ABC
b. A (B+C)
c. A + BC
d. none of these

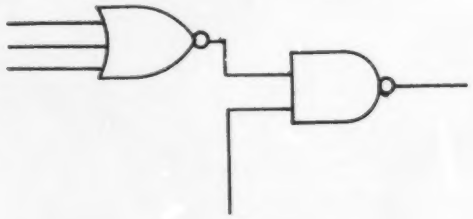


___ 4. A standard power supply for TTL logic circuits is:

a. 3 volts
b. 5 volts
c. 9 volts
d. 15 volts

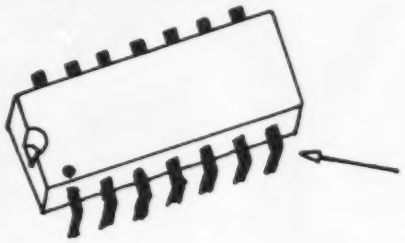
_____ 5. A TTL logic circuit is coupled to another TTL logic circuit as shown below. A VTVM connected from the output of chip 1 to ground reads 2.9 volts in the 'on" state and .3 volts in the "off" state. This indicates:

a. chip 1 is malfunctioning
b. chip 2 is malfunctioning
c. chip 1 or chip 2 is bad, but more tests are needed to isolate the problem
d. chip 1 is functioning within specifications

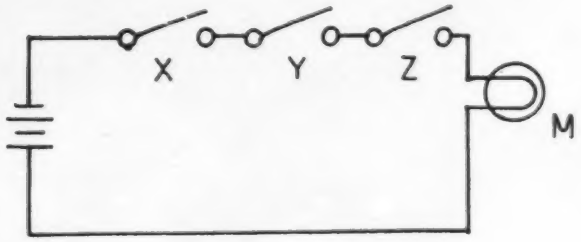


_____ 6. What pin in the drawing below, is the arrow pointing to?

a. pin 1
b. pin 7
c. pin 8
d. pin 14



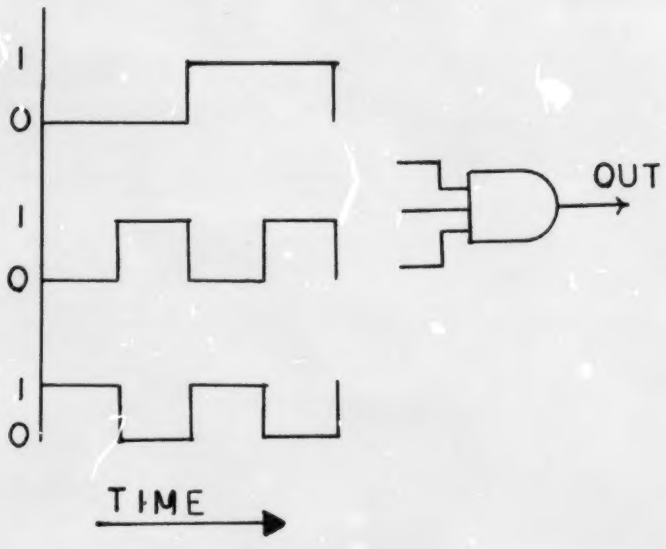
_____ 7. Fill in the truth table for the three input AND circuit:



X	Y	Z	M
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	

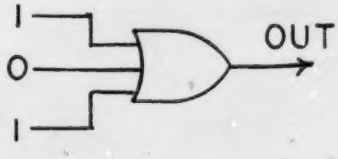
8. The input wave form in this figure will produce what output?

a. 1
b. 0
c. Spike



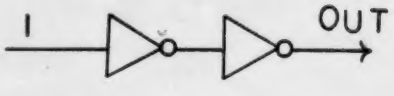
9. In the figure below, what is the output?

a. 1
b. 0
c. no output



10. In the figure below, what is the output?

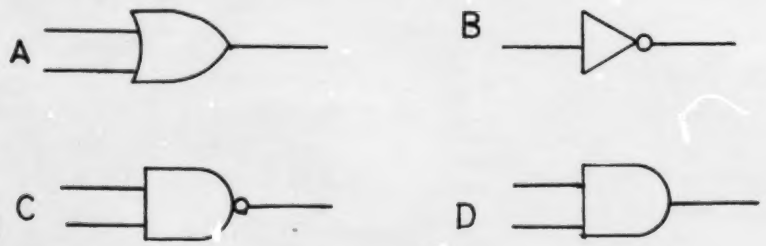
a. 1
b. 0
c. no output



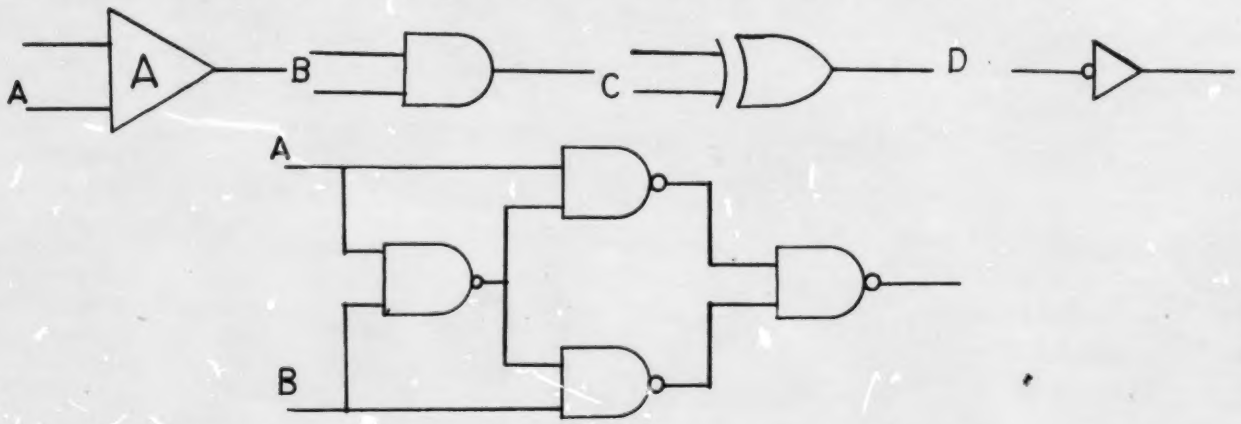
11. Which instrument would you most likely use to trouble shoot logic circuits?

a. voltmeter
b. ohmmeter
c. logic probe
d. transistor checker

_____ 12. Which symbol represents an AND function?

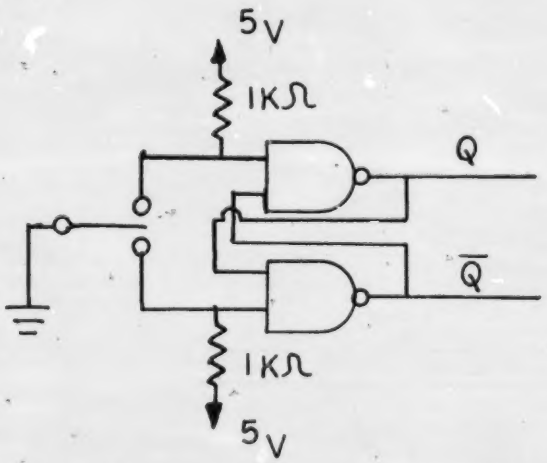


_____ 13. Which schematic symbol (A, B, C, D) best describes the function of the circuit as drawn below:



_____ 14. What is the function of this circuit?

a. amplifier
b. Colpitts oscillator
c. flip-flop
d. modulo 3 counter



_____ 15. This truth table represents the function of a (an)

a. OR gate
b. NAND gate
c. AND gate
d. inverter

A	$\overline{A}$	F
0	1	1
1	0	0

14

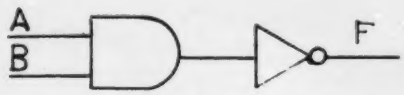
___ 16. This truth table represents the function of a (an)

A	B	F
0	0	0
0	1	1
1	0	1
1	1	1

a. OR gate
b. NOR gate
c. AND gate
d. none of the above

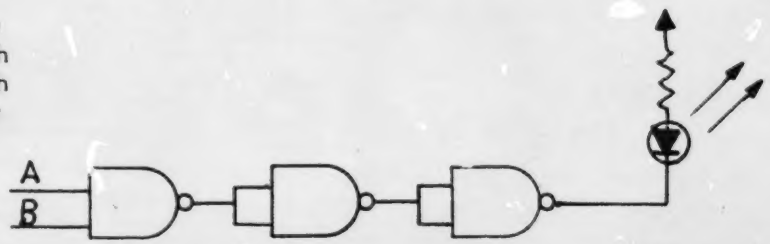
___ 17. This circuit represents an implementation of the:

a. AND function
b. NOR function
c. NAND function
d. none of the above



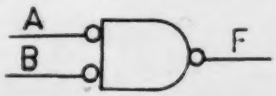
___ 18. State the conditions necessary for the LED to light:

a. A high B low
b. A high B high
c. A low B high
d. A low B low



___ 19. This circuit represents an implementation of the:

a. NAND NAND function
b. NAND function
c. NOR function
d. OR function



___ 20. Which of the following input combinations will give a high output for the circuit:

a. $AB + CD + ABCD$
b. $\overline{A}\ \overline{B}\ \overline{C}\ \overline{D}$
c. $A\ B\ \overline{C}\ \overline{D}$
d. $\overline{A}\ \overline{B}\ C\ D$

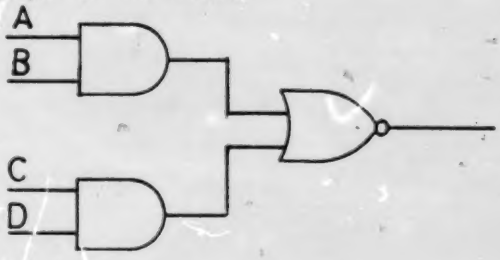


Figure 3-1

7408 AND

GATE 1

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

GOOD BAD

GATE 2

C	D	Y
0	0	0
0	1	0
1	0	0
1	1	1

GATE 3

E	F	Y
0	0	0
0	1	0
1	0	0
0	0	0

GATE 4

G	H	Y
0	0	0
0	1	0
1	0	0
1	1	1

7486 XOR

GATE 1

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

GOOD BAD

GATE 2

C	D	Y
0	0	0
0	1	1
1	0	1
1	1	1

GATE 3

E	F	Y
0	0	0
0	1	1
1	0	1
1	1	1

GATE 4

G	H	Y
0	0	0
0	1	1
1	0	1
1	1	1

7402 NOR

GATE 1

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	0

GOOD BAD

GATE 2

C	D	Y
0	0	0
0	1	1
1	0	1
1	1	0

GATE 3

E	F	Y
0	0	0
0	1	1
1	0	1
1	1	0

GATE 4

G	H	Y
0	0	0
0	1	1
1	0	1
1	1	0

7432 OR

GATE 1

A	B	Y
0	0	1
0	1	1
1	0	1
1	0	1
1	1	0

GOOD BAD

GATE 2

C	D	Y
0	0	1
0	1	1
1	0	1
1	1	0

GATE 3

E	F	Y
0	0	1
0	1	1
1	0	1
1	1	0

GATE 4

G	H	Y
0	0	1
0	1	1
1	0	1
1	1	0

7400 NAND

GATE 1

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

GOOD BAD

GATE 2

C	D	Y
0	0	1
0	1	0
1	0	0
1	1	0

GATE 3

E	F	Y
0	0	1
0	1	0
1	0	0
1	1	0

GATE 4

G	H	Y
0	0	1
0	1	0
1	0	0
1	1	0

7404 NOT

GATE 1

A	Y
1	0
0	1

GOOD BAD

GATE 2

C	Y
1	0
0	1

GATE 3

E	Y
1	0
0	1

GATE 4

G	Y
1	0
0	1

GATE 5

I	Y
1	0
0	1

GATE 6

K	Y
1	0
0	1

TASK: To service DC power supplies:

Questions 1-9 refer to the power supply schematic.

___ 1. The measured AC ripple shows a frequency of 60Hz. B+ measures lower than normal value. Which of the following is the most probable cause?

a. circuit operating normally
b. D_1 open
c. L_1 open
d. C_3 leaking

___ 2. The fuse repeatedly opens when switch is turned on. Which of the following is the most probable cause?

a. T_1 open
b. switch open
c. C_1 open
d. C_2 shorted

___ 3. A scope shows that the output voltage is 70 volts and the ripple peak-to-peak is 5 volts. This indicates:

a. resistor R_2 is open
b. capacitor C_2 is "leaky"
c. capacitor C_3 is open
d. circuit is functioning normally

___ 4. A VOM on AC volts across the primary should measure 120 VAC but the reading is zero. The fuse checks OK, the switch checks OK leaving the most likely fault to be:

a. capacitor C_1 shorted
b. resistor R_1 shorted
c. line cord open
d. transformer primary shorted to case

___ 5. M_1 does not light; however, B+ appears normal. R_1 continuity reads within tolerance. Which of the following is most probable cause?

a. M_1 open
b. C_1 open
c. impossible malfunction
d. F_1 open

___ 6. The power supply has been de-energized for approximately 5 minutes. You inadvertantly touch the B+ line and receive a shock. Which of the following is the most probable cause?

a. L_1 shorted
b. C_3 shorted
c. F_1 open
d. R_2 open

_____ 7. Transformer secondary voltage is normal. Voltage from the anodes of D_1 and D_2 to ground reads 0 volts. Resistance reading from the anode of D_1 to ground and the anode of D_2 to ground is approximately 20K Ω on R × 1K range to ground. What is the problem?

a. normal indication
b. T_1 open center tap
c. L_1 open
d. primary T_1 open

_____ 8. The DC output voltage is only 56 volts. A 1000 microfarad capacitor is "bridged" across C_3 and the output stays at 56 volts. The next step would be to:

a. replace resistor R_2
b. replace capacitor C_3
c. check the voltage drop across the diodes
d. bridge capacitor C_2 with the 1000 microfarad capacitor

_____ 9. What is the minimum PIV of D_1 and D_2?

a. 55V
b. 110 V
c. 156 V
d. 312 V

THE FOLLOWING QUESTION **DOES NOT** REFER TO THE SCHEMATIC

_____ 10. Secondary voltage of a full wave power supply measures 24 volts AC CT (12V-0V-12V). What should be the approximately B+ if the circuit is functioning normally?

a. 12V
b. 16V
c. 20V
d. 32V

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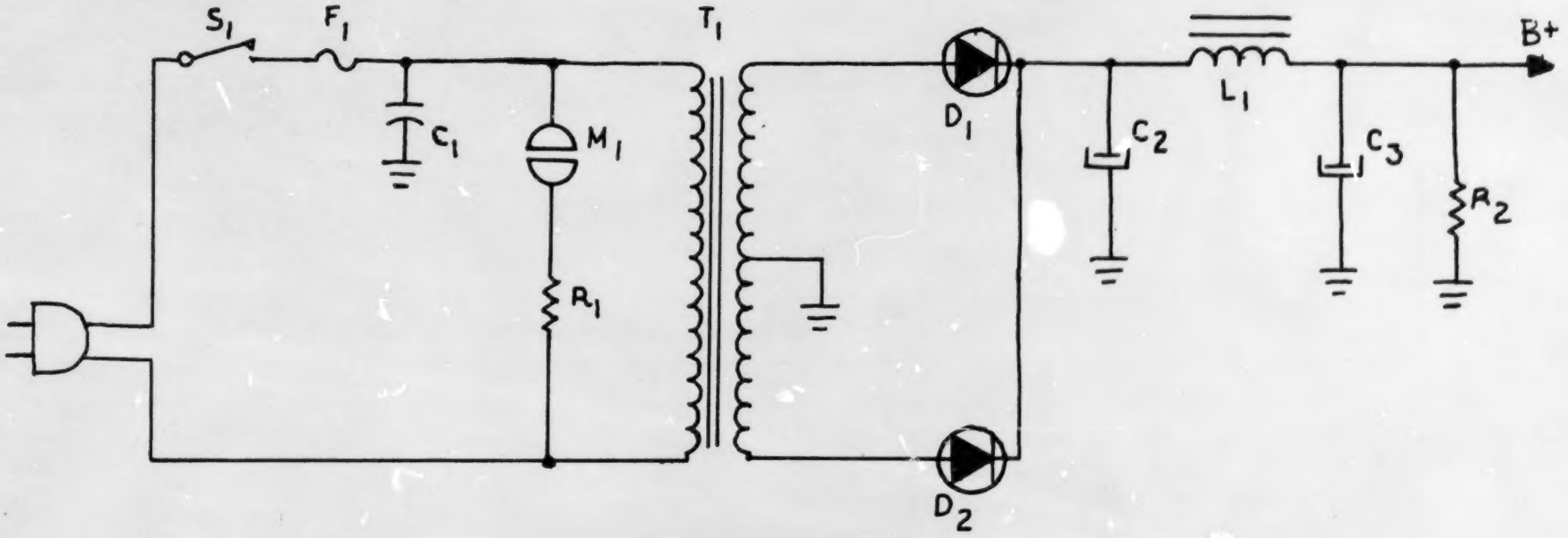
POWER SUPPLY



L_1	2 Hy	C_1	0.05 µFD (600VDC)	R_2	1,500Ω 5W
M_1	Ne 2	C_2	1,000 µFD (150VDC)	T_1	1:1 110VAC Pri 110 VAC Sec. (55-0-55)
S_1	SPST, 250V, 5A	C_3	1,000 µFD (150VDC)		
F_1	½ A	R_1	220KΩ ½W	D_1	1A, 500 PIV
B+	72V			D_2	1A, 500 PIV

COMPETENCY NO. 4
Schematic

COMPETENCY NO. 4
Chart

DC POWER SUPPLY

Figure 4-1

	Component Identification	Specifications and Ratings	Reason Checked	Results
1				
2				
3				
4				
5				

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TASK: To service solid state amplifiers (AF/RF):

Refer to RF amplifier schematic.

_____ 1. If C_3 opens the RF signal at the left side of R_3 will:
a. be zero
b. be higher than normal
c. be less than normal

_____ 2. If L_1 opens the RF output will:
a. drop to zero
b. be reduced slightly
c. be much higher than normal

_____ 3. What is the purpose of R_2?
a. feedback
b. bias for Q_1
c. coupling resistor
d. fusible resistor

_____ 4. Q_1 is a (an)?
a. insulated gate FET (depletion type)
b. insulated gate FET (enhancement type)
c. field effect transistor (N-channel)
d. field effect transistor (P-channel)

_____ 5. R_4 is hot to the touch and discolored. The probable cause is:
a. CT_1 open
b. C_5 open
c. C_5 shorted
d. L_1 shorted turns

_____ 6. There is no signal output from Q_1. Which could be the cause:
a. T_1 shorted turns
b. open L_1
c. open R_4
d. any of the above

_____ 7. Drain voltage of Q_1 measures 16V this indicates:
a. R_4 open
b. C_2 open
c. C_4 open
d. R_2 open

_____ 8. Drain voltage of Q_1, is 0V DC, this indicates:
a. Q_1 open
b. Q_1 shorted
c. C_5 open
d. R_3 open

_____ 9. Q_1 will not pass a signal from the signal generator when applied to the gate, this indicates:
a. T_1 shorted turns
b. R_3 open
c. C_1 open
d. C_2 open

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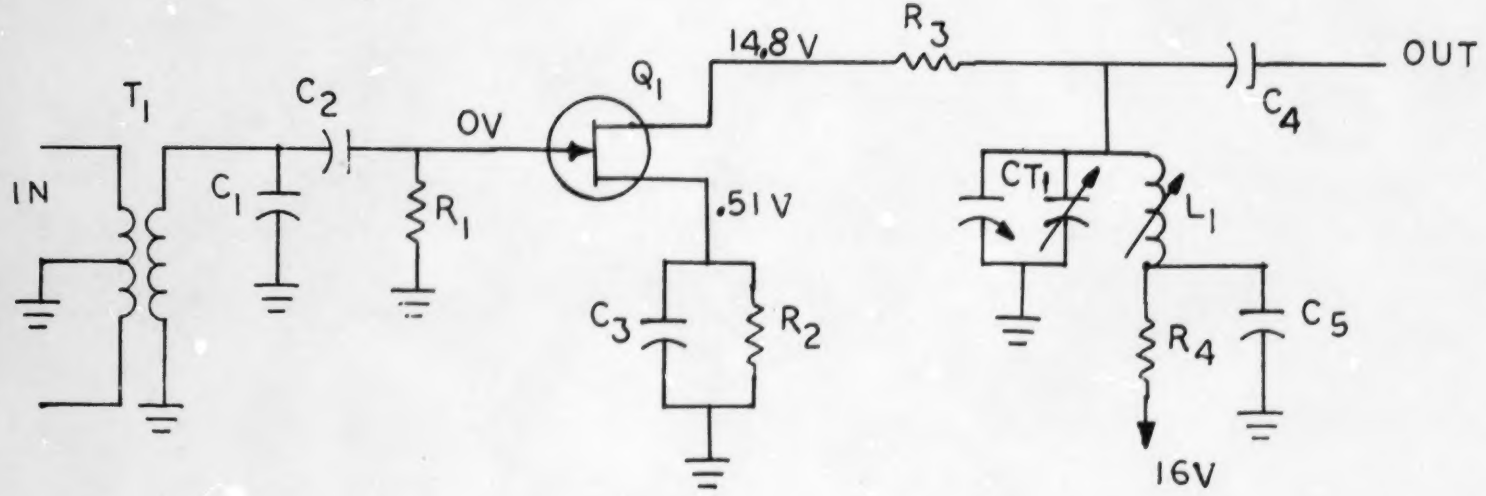
RF AMPLIFIER SCHEMATIC



T_1	Antenna input transformer	C_4	5 ρFD	R_2	100Ω
C_1	15 ρFD	C_5	0.002 μFD	R_3	100Ω
C_2	15 ρFD	CT_1	Tuning Capacitor	R_4	100Ω
C_3	0.0033 μFD	R_1	470KΩ	L_1	Tuning Inductor

Refer to AF amplifier schematic.

_____ 1. The DC voltage at the top side of R_{11} reads 10.0 volts. The DC voltage at the emitter of Q_2 reads 9.8 volts. This conditions is probably:

a. an indication that C_{10} is shorted
b. an indication that R_{11} is shorted
c. an indication that Q_2 is shorted
d. none of these

_____ 2. If a scope shows a signal on the left of C_1 and no signal on the left of C_6, it indicates that:

a. ICI should be replaced
b. C_4 could be shorted
c. C_2 has too much capacitance
d. C_3 could be open

_____ 3. If R_8 increases 20% in value:

a. the DC voltage from collector of Q_1 will be more positive than normal
b. Q_1 will probably short
c. C_9 is open
d. none of these

_____ 4. The approximate voltage at the base of Q_1 should be:

a. zero volts
b. 9.6 volts
c. 11 volts
d. none of these

_____ 5. The scope shows audio signal at the right of C_6 and no signal at the right of C_7. This indicates that we should:

a. check for audio signal on wiper arm of R to ground
b. replace C_7
c. replace the potentiometer
d. replace R_6

_____ 6. If C_{10} opens, the DC voltage across R_{11} will:

a. increase slightly
b. remain the same
c. decrease slightly
d. none of these

_____ 7. If C_7 opened, what would be the result?

a. increased output
b. Q_1 would short out
c. no output
d. no change in output

_____ 8. If C_9 opens:

a. R_7 will smoke
b. Q_1 will go to saturation
c. C_8 would open
d. the gain of Q_1 stage decreases

_____ 9. What is the primary purpose of R_6 and R_9?

a. fusible resistors
b. to establish feed back
c. divider network to establish bias for Q_1
d. to increase the gain of Q_1 stage

_____ 10. If C_{10} opened, what would result?

a. "floating" emitters on Q_2 and Q_3
b. increased speaker output
c. operation would remain normal
d. no speaker output

_____ 11. If Q_3 opens, which of the following happens?

a. Q_2 cannot conduct
b. R_8 gets hot
c. D_1 will open
d. the speaker will burn out

_____ 12. ICI will not pass a signal; which of the following is the probable cause:

a. C_1 open
b. C_6 open
c. R_4 open
d. R_1 open

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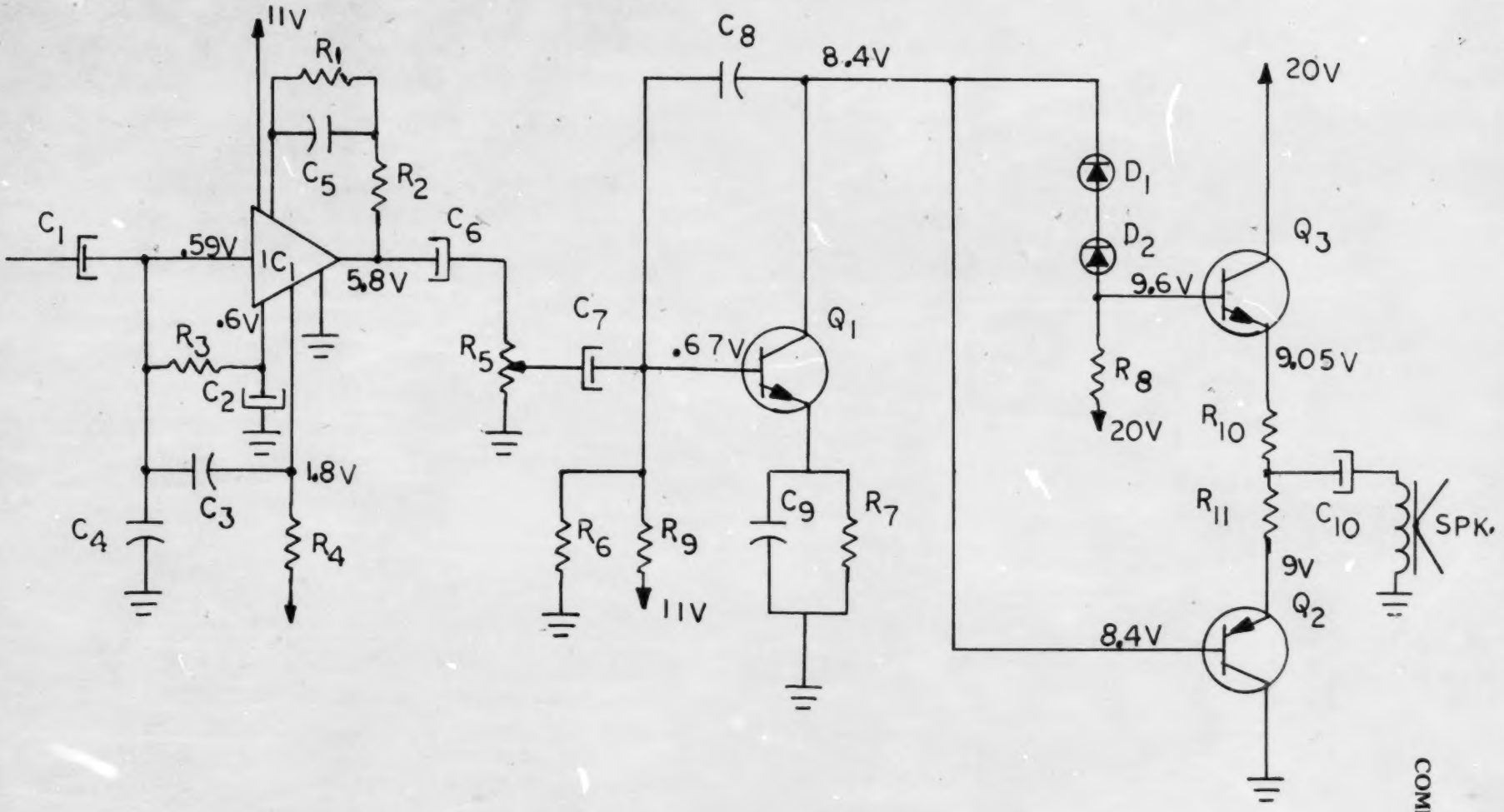
AF AMPLIFIER SCHEMATIC



C_1	4.7 μFD	C_5	0.01 μFD	C_9	50 μFD	R_3	120KΩ	R_8	680Ω
C_2	40 μFD	C_6	1 μFD	C_{10}	500 μFD	R_4	220KΩ	R_9	33KΩ
C_3	20 μFD	C_7	1 μFD	R_1	150KΩ	R_5	100KΩ	R_{10}	0.55Ω
C_4	150 μFD	C_8	330 μFD	R_2	150KΩ	R_6	4.7KΩ	R_{11}	0.55Ω
						R_7	47Ω	Spk.	6" 8Ω

COMPETENCY NO. 5
Schematic

AF AMPLIFIER

Figure 5-1

	Component Identification	Specifications and Ratings	Reason Checked	Results
1				
2				
3				
4				
5				

AF AMPLIFIER

	Component Identification	Specifications and Ratings	Reason Checked	Results
1				
2				
3				
4				
5				

RF AMPLIFIER

	Component Identification	Specifications and Ratings	Reason Checked	Results
1				
2				
3				
4				
5				

TASK: To service solid state oscillator circuits:

Refer to Hartley oscillator schematic

_____ 1. What is the primary function of L_1 and C_1?

a. determine frequency
b. DC voltage divider
c. DC bias
d. emitter stabilization

_____ 2. What is the primary function of C_3?

a. collector neutralization
b. determines oscillator frequency
c. provides feedback from collector to tank
d. provides feedback from tank to collector

Refer to Colpitts oscillator schematic

_____ 3. What is the primary function of R_2 and R_3?

a. determines frequency of oscillator
b. DC voltage divider for bias
c. provides degenerative feedback
d. provides regenerative feedback

_____ 4. What is the primary function of C_3?

a. provides DC decoupling
b. feedback path from tank to collector
c. works with C_4 to provide AC voltage divider bias
d. provides RF decoupling

Refer to multivibrator schematic

_____ 5. What is the primary function of Q_1 and Q_2?

a. control the frequency
b. acts as switches
c. voltage regulators

_____ 6. What is the primary function of R_1 and R_2?

a. established DC base bias
b. AC decoupling
c. regenerative feedback
d. DC collector loads

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Refer to RC phase shift schematic

_____ 7. What is the probable malfunction if the collector voltage to ground reads 9V?

a. R_1 open
b. Q_1 open
c. R_2 too low in value
d. Q_1 shorted

_____ 8. If C_1 opens, what is the result?

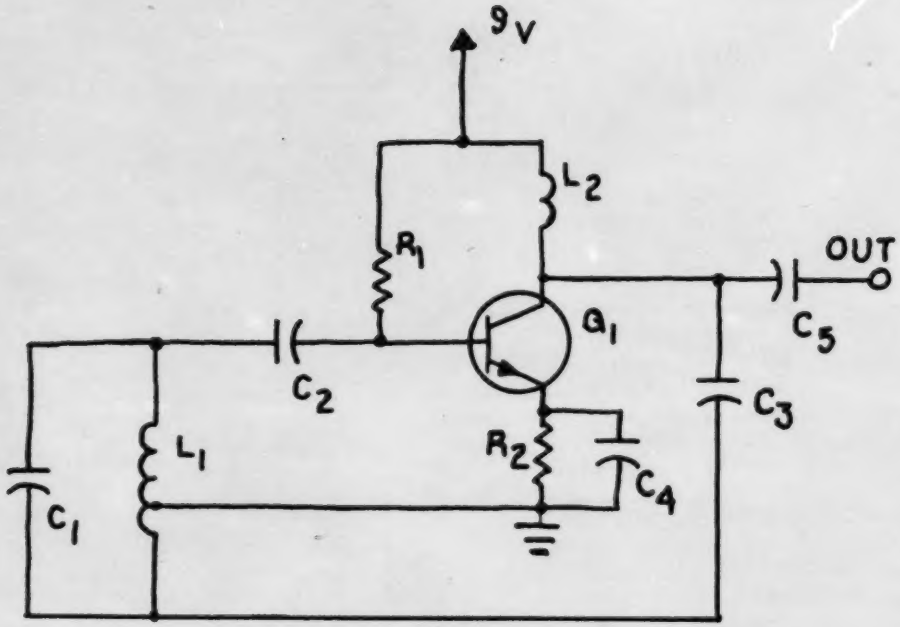
a. Q_1 will short
b. DC voltage from collector to ground goes to 9V
c. DC voltage on the collector remains at 4.7 V
d. AC output signal voltage will increase

Refer to crystal schematic

_____ 9. If R_2 opens, what is the result?

a. drain = 18V DC, source = OV DC, gate = OV DC
b. drain = 18V DC, source = 18V DC, gate = OV DC
c. drain = 18V DC, source = 18V DC, gate = 18V DC
d. drain = OV DC, source = OV DC, gate = OV DC

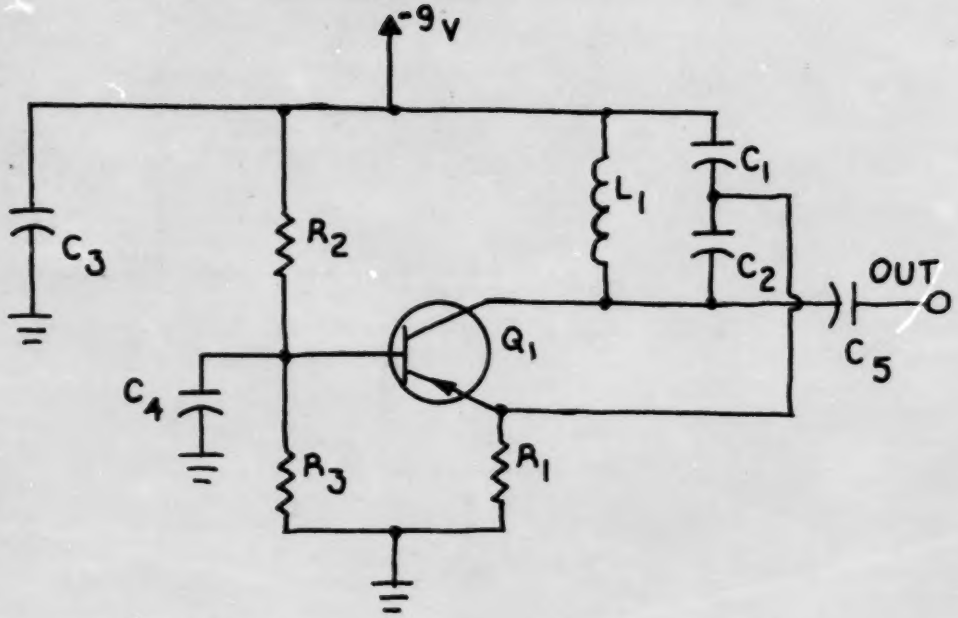
HARTLEY



C_1	470 pFD	R_1	270KΩ ½W	L_1	Miller# 2021 Broadcast band coil
C_2	47 pFD	R_2	390Ω ½W	L_2	30 mHy choke Miller # 6213
C_3	0.001μFD	Q_1	2N6004	C_5	0.001 μFD
C_4	0.01μFD				

COMPETENCY NO. 6
Schematic

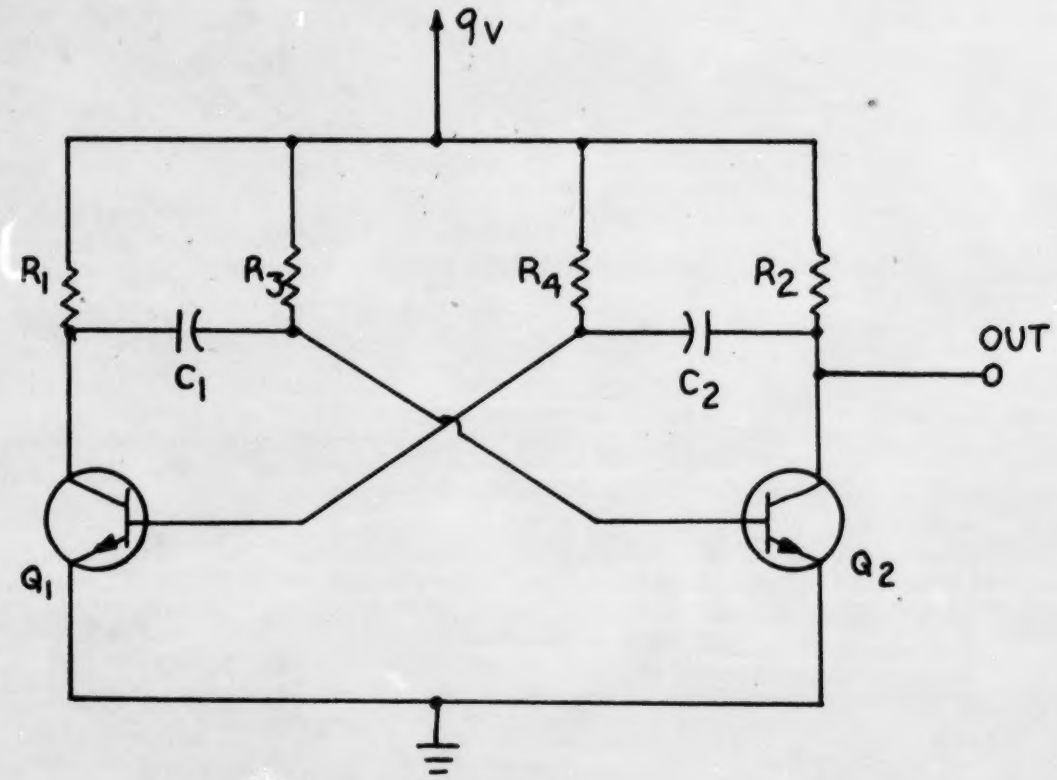
COLPITTS



R_1	3.3KΩ	½W	C_1	0.0015μFD	C_4	0.001μFD
R_2	8.2KΩ	½W	C_2	0.008μFD	Q_1	SK 3004
R_3	4.7KΩ	½W	C_3	0.001μFD	L_1	200μHy Miller # 6154
					C_5	0.001 μFD

COMPETENCY NO. 6
Schematic

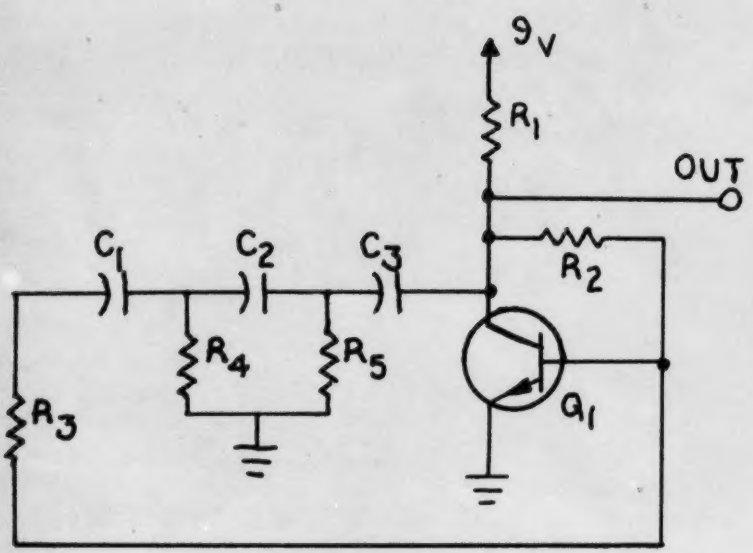
MULTIVIBRATOR



R_1, R_2	470Ω	Q_1, Q_2	GE-86
R_3, R_4	22KΩ	C_1, C_2	500 pFD

COMPETENCY NO. 6
Schematic

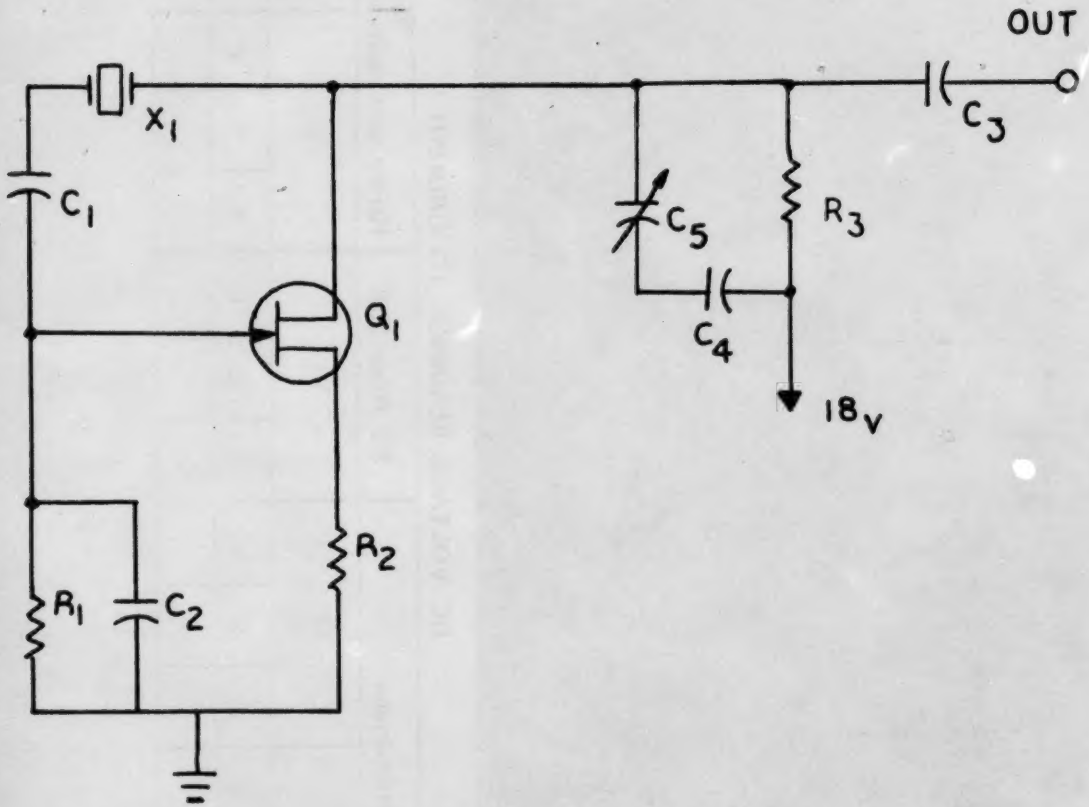
RC PHASE SHIFT



Q_1	2N5172	R_3, R_4, R_5	4.7KΩ ½W
R_1	3.3KΩ ½W	C_1, C_2, C_3	0.047μFD
R_2	470KΩ ½W		

COMPETENCY NO. 6
Schematic

CRYSTAL



R_1	47KΩ ½W	C_1	220 pFD Mica	C_4	500 pFD Mica
R_2	27Ω ½W	C_2	15pFD Mica	C_5	0-50 pFD
R_3	1,500Ω ½W	C_3	100 pFD Mica	Q_1	2N5951
				X_1	8-12 Mega-Hertz

COMPETENCY NO. 6
Schematic

COMPETENCY NO. 6
Part A
Charts

Figure 6-1

AC OUTPUT CHART

Oscillator	SCOPE			VTVM
	Wave Form	Frequency	P-P Voltage	AC Voltage
Multivibrator				
RC Phase Shift				
Hartley or Colpitts				
Crystal				

Figure 6-2

DC VOLTAGE READINGS TO GROUND

Multivibrator						RC Phase Shift			Hartley or Colpitts			Crystal		
Q_1			Q_2			Q_1			Q_1			Q_1		
E	B	C	E	B	C	E	B	C	E	B	C	S	G	D

PRELIMINARY MEASUREMENT CHARTS

AC OUTPUT CHART

Figure 6-3

Oscillator	SCOPE			VTVM
	Wave Form	Frequency	P-P Voltage	AC Voltage
Multivibrator				
RC Phase Shift				
Hartley or Colpitts				
Crystal				

DC VOLTAGE READINGS TO GROUND

Figure 6-4

Multivibrator						RC Phase Shift			Hartley or Colpitts			Crystal		
Q_1			Q_2			Q_1			Q_1			Q_1		
E	B	C	E	B	C	E	B	C	E	B	C	S	G	D

COMPONENTS REMOVED FOR TESTING

Figure 6-5

_____ Oscillator

Component Identification	Specifications and Ratings	Reason Checked	Result
1			
2			
3			
4			
5			

COMPONENTS REMOVED FOR TESTING

_____ Oscillator

Figure 6-5

	Component Identification	Specifications and Ratings	Reason Checked	Result
1				
2				
3				
4				
5				

COMPONENTS REMOVED FOR TESTING

_____ Oscillator

Figure 6-5

	Component Identification	Specifications and Ratings	Reason Checked	Result
1				
2				
3				
4				
5				

COMPONENTS REMOVED FOR TESTING

_____ Oscillator

Figure 6-5

	Component Identification	Specifications and Ratings	Reason Checked	Result
1				
2				
3				
4				
5				

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POST REPAIR CHART

AC OUTPUT

Figure 6-6

Oscillator	SCOPE			VTVM
	Wave Form	Frequency	P-P Voltage	AC Voltage
Multivibrator				
RC Phase Shift				
Hartley or Colpitts				
Crystal				

DC VOLTAGE READINGS TO GROUND

Figure 6-7

Multivibrator						RC Phase Shift			Hartley or Colpitts			Crystal		
Q_1			Q_2			Q_1			Q_1			Q_1		
E	B	C	E	B	C	E	B	C	E	B	C	S	G	D